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ALASKA DEPARTMENT OF FISH AND GAME
DIVISION OF COMMERCIAL FISHERIES

1992 SOUTHERN DISTRICT (KACHEMAK BAY) DUNGENESS CRAB POT SURVEYS

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INTRODUCTION

In 1990 the department began a pot survey for Dungeness crabs (Cancer magister) in Kachemak Bay, which is part of the Southern District of the Cook Inlet Management Area (Figure 1). Since its inception, the survey has evolved from an assessment of softshell incidence to an index of abundance. A summary of the current objectives is as follows:

1) Identify the annual timing of the molt, or molts, of catchable Dungeness crabs, both male and female.

2) Document the percentage of soft shell Dungeness crabs.

3) Document the sex, size and shellage of all Dungeness crabs and the egg condition of all female Dungeness crabs.

4) Establish an index of abundance of Dungeness crabs.

5) Document the incidental catch of king and Tanner crabs.

6) Document the difference in catch between pots with escape rings open and pots with escape rings closed.

The crab trawl surveys in Cook Inlet began in 1989, but were not fully implemented until 1990. The primary goal of the trawl survey was to assess Tanner (Chionoecetes bairdi) and red king crab (Paralithodes camtschaticus) stocks. Ancillary information, such as Dungeness catch, was documented. The initial survey design did not focus on Dungeness, since during likely survey months, June - August (post Tanner and king molt), a portion of the Dungeness stock would not be available to the gear, i.e., they were in waters too shallow to sample with a trawl. These Dungeness data will be presented in this report to allow comparison to the pot survey catches.

METHODS

In 1992 the State chartered the F\V Lion of Judah for the entire survey. Standard Dungeness pots of two distinct weights were used for the survey: pots used east and west of Homer Spit were 60 and 100 pounds, respectively. The gear dimensions reflected those generally used by commercial fishermen. Bait types used were squid and razor clams, east and west of Homer Spit, respectively. These bait types also reflect those commonly used by commercial fishermen. Initial soak time goals were 24 hours east of the Spit and 48 hours west of the Spit. The variation in soak times was the result of both fishermen comments regarding the time necessary for the pots to begin fishing and cost of the charter.

All commercial Dungeness gear is required by regulation to have two 4 3/8 inch diameter circular escape rings. The intent of the escape ring regulation is to permit the egress of female and sublegal male crabs from the pot thereby reducing the incidence of handling of non-target crabs. The escape rings were left open in two-thirds of the survey gear in order to indicate catches of commercial fishermen. Every third pot, or one-third of the gear, was fished with the escape rings closed. This was done in order to determine the relative magnitude of small crabs that these pots were capable of capturing and retaining.

Selection of survey stations was systematic. Commercial fishermen were interviewed in order to determine specific locations for crab capture given the time of year the survey was to occur. A total of 180 stations were selected, 90 east (Appendix A) and 100 west of Homer Spit (Appendix B). The time span of the respective surveys within the year was based on fishermen input, historical catch figures, suspected, and known molt timing of catchable males and available funding for the project.

The gear was set east of Homer Spit in three 15 pot strings in the Mud Bay area and 15 three pot springs in the upper bay (Figure 2). Ten 10 pot strings were fished west of Homer Spit (Figure 3). Distance between individual pots within a string was approximately 0.25 nautical miles east of Homer Spit and 0.20 nautical miles west of the Spit.

A Loran C, video plotter and echo sounder were used to record pot and station information for future reference and replication. Depths were recorded at the time the gear was set utilizing the vessel's sounder. Documented depths do not take into consideration the stage of the tide.

Speed was often essential while pulling the pots. Shallow sets coupled with running tides and currents made it necessary to move through the gear with maximum efficiency in order to retrieve all the pots before the water became too shallow for the vessel or the current pulled the buoys under. In some instances therefore, the bycatch species were sampled only to species and sex.

Once each pot was pulled, all Dungeness, king and male Tanner crabs were measured to the nearest millimeter (mm) of carapace width (Dungeness and Tanner) or length (king) and shell aged. Relative fecundity of all Dungeness and king crab females was determined. Juvenile female Dungeness were not identified since positive classification would have required destroying the animal. Female Tanners were counted only.

RESULTS

East of Homer Spit

The dates for the seven surveys east of Homer Spit were: May 31 - June 2, June 30 - July 2, July 27 - July 29, Aug. 11 - Aug. 13,

Aug. 25 - Aug 27, Sept. 10 - Sept. 12 and Oct. 7 - Oct. 9. Ninety pot lifts occurred in three of the seven surveys east of the Spit. A single pot was lost in each of the remaining four surveys therefore reducing the total pot lifts per respective survey to 88 or 89. Fishing depths ranged from 0.8 to 9.7 fathoms, averaging 3.6 fathoms. Soaks varied from 21 to 26 hours with a mean of 23 hours (Table 1).

The Dungeness catch from the 5/31 - 6/2 survey was 456 males and 27 females. Sublegal and legal males numbered 276 and 180, respectively. Two (<1 %) of the males were in a soft shell condition (Table 2). Twenty four percent of the legal males were new shells; 76 percent were skipmolts. Sublegal percentages for new shells and skipmolts were 13 and 87, respectively (Table 3). The size range of the males was 136 to 190 mm with an average of 163 mm (Table 4). Virtually all the legals were in the recruit size range (165 - 189 mm) (Figure 4). Two of the 27 females captured were bearing uneyed eggs; the remaining were non-ovigerous (Table 5).

The 6/30 - 7/2 survey resulted in a catch of 1,161 males and 76 females. Five hundred eighty three males were sublegal, while the remaining 578 were legal. Thirty one (3 %) of the males were soft shelled (Table 2). Forty five percent of the legals were new shells; 55 percent were skipmolts. Sublegal percentages were 26 and 74 for new shells and skipmolts, respectively (Table 3). The males ranged in size from 137 to 191 mm, averaging 165 mm (Table 4). Almost all legal males were in the recruit size range (Figure 5). All of the 76 females captured were non-ovigerous (Table 5).

The 7/27 - 7/29 survey produced a catch 1,152 males and 65 females. Sublegal males numbered 621 while legals accounted for 531 crabs. Fifty (4 %) of the males were in a soft shell condition (Table 2). Forty nine percent of the legal males were new shells while the remaining 51 percent were skipmolts. Shellage percentages for

sublegals were 34 and 66 for new shells and skipmolts, respectively (Table 3). The size range of all the males caught was 139 - 194 mm with an average of 165 mm (Table 4). Again virtually all of the legal males were in the recruit size class (Figure 6). None of the 65 females captured were ovigerous (Table 5).

The 8/11 - 8/13 survey yielded a catch of 1,641 males, 849 sublegal and 792 legal, as well as 47 females. Fourteen (1%) of the males were in a soft shell condition (Table 2). Forty one percent of the legal male catch consisted of new shell recruits, while 32 percent of all the sublegals were new shells (Table 3). The males varied in size from 142 to 196 mm, averaging 165 mm (Table 4 and Figure 7). None of the 47 females caught were ovigerous (Table 5).

The fifth survey conducted 8/25 - 8/27 resulted in a catch of 1,590 males and 47 females. Eight hundred fifty three of the males were sublegal and 737 were legal. Twenty four (2%) of the males were in a soft shell condition (Table 2). Fifty eight percent of the legal crabs were new shells; the remaining 42 percent were skipmolts. Of the sublegal males, 43 percent were new shells and 57 percent were skipmolts (Table 3). The average size of all the males captured was 164 mm within a range of 126 - 194 mm (Table 4 and Figure 8). All of the 47 females were non-ovigerous (Table 5).

The sixth survey was performed between 9/10 and 9/12 and resulted in a catch 621 sublegals and 749 legals totalling 1,370 male Dungeness crabs. Four (<1%) of the males were in a soft shell condition (Table 2). Fifty eight percent of the legal males and 41 percent of the sublegal males were new shells (Table 3). The size range of the males was 139 - 193 mm with an average of 166 mm (Table 4 and Figure 9). For the third survey in succession 47 non-ovigerous females were caught (Table 5).

The final survey east of Homer Spit was conducted between 10/7 and 10/9. A total of 865 males were caught, 516 were sublegal and 349

were legal. Two (<1%) of the males were in a soft shell condition (Table 2). New shell percentages were 73 and 49 for the legal and sublegal males, respectively (Table 3). The average size of the males was 167 mm within a range of 139 - 192 mm (Table 4 and Figure 10). None of the 19 females captured were ovigerous (Table 5).

Twenty one male and no female Tanner crabs were caught during the Dungeness pot survey east of Homer Spit. All of the 21 males were caught during the 5/31 - 6/2 survey. No king crabs were caught (Table 6).

West of Homer Spit

The two surveys west of the Spit were July 5 - 7 and August 5 - 7. Ninety six and 78 pots were pulled west of the Spit in July and August, respectively. Four pots were lost in July and two in August. Fishing depth ranged from 15.0 to 45.0 fathoms, averaging 27 fathoms. Soak times varied from 47 to 50 hours with a mean of 49 hours (Table 1).

The July survey west of Homer Spit resulted in a catch of 21 males and 30 females. Fourteen of the males were legal. One (5 %) of the males were in a soft shell condition (Table 2). Five of the legal and three of the sublegal males were new shells (Table 3). The males ranged in size from 156 to 202 mm with an average of 171 mm (Table 4). None of the 30 females were ovigerous (Table 5).

The survey conducted in August resulted in a catch of 108 males, 59 legals and 49 sublegals, as well as 59 females. None of the males were soft shelled (Table 2). New shell percentages were 68 and 67 for legals and sublegals, respectively (Table 3). The size range of the males was 145 - 204 mm, averaging 167 mm. Of the 59 females, none were ovigerous (Table 5).

Thirty five male and four female Tanner crabs were found in the July survey. Forty males and four females were caught in August. No king crabs of either sex were captured (Table 6).

Escape rings

Retention of sublegal males was clearly greater in pots with escape rings closed versus those with escape rings open. Overall sublegal catch per pot was 7.5 with rings closed as opposed to 4.2 with rings open. Catch rates for legal crabs was virtually identical with 5.3 and 5.1 crabs per pot in gear with rings closed and open, respectively. It should be noted that although pots with rings closed retained more small crabs than pots with rings open, these crabs were in the same size group; they did not catch crabs that were any smaller than the ones found in the ring open pots (Table 7).

1989 - 1992 trawl surveys

Male Dungeness catches from the 1989 - 1992 trawl survey were 304, 317, 234 and 211 crabs, respectively. Mean carapace widths for these successive years were 118, 134, 155 and 157 mm (Fig 11). Females numbered 630, 660, 476 and 476 crabs for 1989 through 1992. Average carapace widths were 124, 129, 134 and 143 mm (Fig 12). The trawl survey has been conducted in July except in 1989 when it was in October (Table 8).

DISCUSSION

Growth and Recruitment

In 1990 both pot and trawl surveys identified poor recruitment into the legal segment of the stock. The extremely low catches of legal crabs in the 1990 pot survey indicated a very low abundance of legal males. This was reflected in the ensuing commercial fishery which resulted in a 23 year record low harvest of 29,000 pounds (Table 9).

Further review of the pot and trawl survey data collected from east of Homer Spit signified the presence of one or perhaps two Dungeness year classes of substantial magnitude. Both completely recruited into the adult population subsequent to the 1991 molt. Full recruitment into the legal stock was anticipated to occur after the 1992 molt.

The level of recruitment indentified by the 1992 surveys did not meet expectations. Approximately 50 percent of the 1991 prerecruit and recruit crabs failed to molt (skip molted) in 1992 (Figures 4 through 10). Since these data only represent an index of abundance, the lost poundage resulting from the failure to molt can only be estimated, but it likely exceeded 150,000 - 200,000 pounds.

Why did these animals skipmolt? Are skipmolt Dungeness crabs capable of molting again, and if they are capable, will they? Is there a significant difference between the growth of Dungeness east of Homer Spit versus those west of Homer Spit? Direct answers to these questions are not readily available. There are however some inferential data that may shed some light on the skipmolting phenomenon in Kachemak Bay east of Homer Spit.

A comparison of the average size of males between the commercial catch samples taken during the recruit fisheries in the mid 1980's and the crabs found in the 1991 and 1992 survey indicates that the range of mean sizes from 1986 to 1989, 175 to 181 mm (6.90 to 7.11 inches), are larger than the range from the 1991 and 1992 surveys, 170 and 171mm (6.69 and 6.73 inches). Therefore, it appears that the current group of legal males is smaller than normal.

Though other variables such as strong recruitment can mask size data, analysis of historic catch information indicates that males east of Homer Spit may not be capable of growing as large as those west of the Spit. Catch data from commercial fisheries indicate that the Dungeness crabs found west of Homer Spit are capable of growing substantially larger than the recruit size class. In the late 1970's and early 80's, before the fishery was fully developed, it was not uncommon to find 8 and 9 inch crabs with average delivery weights ranging from 2.5 to 2.9 pounds per crab. Although the data are sparse, it appears that the males east of Homer Spit may only be capable of reaching the recruit size class before significant skipmolting begins. Eight inch crabs were uncommon and nine inch crabs were not found. Average weights per delivery ranged from 2.0 to 2.25 pounds per crabs (Table 10). The males west of the Spit may be able to molt more frequently during their life cycle or achieve greater incremental growth per molt. The aforementioned phenomenon has been identified in Tanner crabs in Cook Inlet, i.e., Southern District Tanners seem to be capable of reaching a maximum size significantly larger than crabs from the Kamishak and Barren Islands Districts.

The following data illustrate both a reduction in true prerecruit strength from 1991 to 1992 and a commensurate large increase in skipmolts. Although new crabs appeared as catchable prerecruit ones (140 - 164 mm) in 1992, the magnitude of this age class is considerably smaller than it was in 1991. Using respective August survey catch data from gear in which the escape rings were not

closed, the comparison shows a 50 percent decrease of new shell prercruits from 1991 to 1992, 6.6 versus 3.2 crabs per pot. Additionally, there was a significant increase in the average number of skipmolt prerecruits per pot, the 1991 average for August data was 0.4 compared to the 1992 August data of 5.0 old shell prerecruits per pot.

The 1989 data indicated that the trawl is capable of catching small crabs (75 mm or larger). It, therefore, seems logical to question whether or not the absence of smaller, younger year classes in either the 1990 or 1991 trawl survey is an indication of potentially poor recruitment into the legal segment of the stock in 1993 and 1994? A clear answer is not evident. For example, there were 91 new shell prerecruit ones found in the 1992 survey as opposed to 15 prerecruit twos in the 1991 survey. If these data were truely representative of their respective age classes, then it would be impossible for 15 prerecruit twos to molt and become 91 prerecruit ones. This therefore does add crediblity to the theory that the trawl survey does not by itself always fairly sample the Dungeness population, something it was not designed to do.

Finally, there is circumstantial evidence leading to uncertainty regarding juvenile Dungeness aggregation. Distribution of these small crabs may preclude them from trawl capture at any given time. There is no survey evidence demonstrating the exclusive location of juvenile Dungeness crabs in Kachemak Bay. Personal communication with sport and commercial fishermen indicates that apparent substantial numbers of juvenile crabs reside both in upper Cook Inlet and embayments that are largely intertidal (China Poot). Areas such as this are not trawlable.

Soft Shell Incidence

The pot survey did not identify a large percentage of soft shell males in either 1990, 1991 or 1992. The largest percentages were 13 in 1990, nine in 1991 and four in 1992 (Table 2). In 1990 this in part can be explained by the few available males large enough to be caught and retained in the pot survey. In 1991 and 1992 however, when more adult and legal crabs were available for capture by the pots, the softshell percentage in the pot survey for all males reached its high in June, 1992 at nine percent. Based on the trawl survey results, it appears that a greater percentage of softshells existed in the deeper waters (> 15 fathoms) sampled by the trawl. The July trawl survey resulted in 20 and 24 percent total male soft shells in 1991 and 1992, respectively. Only one soft shell female Dungeness was caught in either of the two trawl surveys (Table 11).

Molt Timing

Molt timing in 1990 can be pieced together by relating the May and June pot and July trawl surveys to an additional crab sample taken in August. The male soft shell percentage from the 1990 pot survey was 13 percent in May and 10 percent in June. The male soft shell percentage identified by the July, 1990 trawl survey was 12. On August 20, 1990, molted Dungeness exoskeletons were found in large numbers within the Homer Boat Harbor. The condition of these shells indicated a recent molt. Of the 100 male carapaces measured, the mean width was 123 mm with a range of 101 to 142 mm. From these latter data it appears that a major portion of the molt took place from mid July to early August.

In 1991 and 1992, however, with significantly larger pot catches, it appears that the molt occurred in late June through July. This is based on both the softshell catch from the trawl survey and the

steady increase in the male catch from the June to the August pot surveys: 226 to 651 to 1,100 male crabs in 1991, and 456 to 1,161 to 1,152 to 1,641 males in 1992 (Table 2). Reviewing the difference in size distribution and soft shell incidence from the 1991 and 1992 data indicates that the Dungeness males may have molted in deep water, which was sampled by the trawl survey, and subsequently migrated to shallower water, which was sampled by the pot survey.

West of Homer Spit

Pot and trawl survey results west of Homer Spit did not indicate that any significant amount of catchable Dungeness crabs were available at the time of the surveys, although there was an increase between 1991 and 1992. It must be noted that the surveys occurred at the time of the historical commercial fisheries. Neither the pot nor the trawl survey are capable of sampling upper Cook Inlet where an unknown quantity of Dungeness crab may exist.

Conclusion

Without significant growth from the large percentage of skipmolt adult males, the likiehood of a stock size large enough to support even a very limited commercial fishery in 1993 is small. Certainly the 1993 survey will yield answers regarding Dungeness skipmolting since the 1992 skipmolts will either reappear in the same size class as older shell crabs, die of old age or grow significantly and appear as new shell crabs.

In summation, future comparison of the pot survey to trawl surveys and commercial fishery are essential in building a database which

can be utilized to fully judge the capability of the pot survey to assess relative abundance of legal male Dungeness crabs in Kachemak Bay.

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Table 1. Station descriptive data, Kachemak Bay Dungeness crab pot surveys, 1992.

Date[1]	Location	Station	No. pots pulled	Depth[2] Range (fms)	Avg. (fms)	Average soak (hrs.)
5/31	East of Spit	Mud Bay	45	0.8–5.8	2.3	26
6/01		Upper Bay	44	3.0–9.7	4.6	22
6/30		Mud Bay	44	1.0–4.7	2.2	25
7/01		Upper Bay	45	3.0–7.3	4.4	21
7/27		Mud Bay	45	2.0–6.7	3.7	24
7/28		Upper Bay	45	3.0–6.8	4.2	21
8/11		Mud Bay	45	2.0–5.8	3.4	23
8/12		Upper Bay	45	2.5–4.7	3.4	23
8/25		Mud Bay	44	2.5–7.0	4.0	24
8/26		Upper Bay	44	3.2–6.5	4.1	22
9/10		Mud Bay	45	2.5–7.0	4.1	23
9/11		Upper Bay	44	2.3–6.0	3.5	23
10/7		Mud Bay	45	1.8–5.0	3.2	24
10/8		Upper Bay	45	2.8–6.3	3.9	22
		TOTAL	625	Avg. 0.8–9.7	3.6	23
7/05	West of Spit	91–100	96	15–38	25.6	47
8/05		91–94& 97–100	78	15–45	29.1	50
		TOTAL	174	Avg. 15–45	27.1	49

1 Date gear was set.
2 Depths calculated from vessels sounder at time gear was set. Not calculated from mean lower low water as used on navigational charts.

Table 2. Dungeness crab catch, in numbers, Southern District Dungeness pot surveys, 1990–92.

Year	Dates	Location	Pots Pulled	Females	Sublegal Males	Legal Males	Total Males	Softshell Males (%)
1990	5/15–5/17	East of Spit	90	53	47	17	64	8 (13)
	6/19–6/21		90	54	65	23	88	9 (10)
1991	6/04–6/06	East of Spit	89	6	116	110	226	21 (9)
	7/09–7/11		90	21	388	263	651	36 (6)
	8/06–8/08		90	85	625	475	1,100	47 (4)
	9/12–9/14		90	30	615	492	1,107	5 (<1)
	7/02–7/06	West of Spit	82	9	6	5	11	2 (18)
	8/14–8/16		95	9	7	11	18	0 (0)
1992	5/31–6/02	East of Spit	89	27	276	180	456	2 (1)
	6/30–7/02		89	76	583	578	1,161	31 (3)
	7/27–7/29		90	65	621	531	1,152	50 (4)
	8/11–8/13		90	47	849	792	1,641	14 (1)
	8/25–8/27		88	47	853	737	1,590	24 (2)
	9/10–9/12		89	47	621	749	1,370	4 (<1)
	10/07–10/09		90	19	516	349	865	2 (<1)
	7/05–7/07	West of Spit	96	30	7	14	21	1 (5)
	8/05–8/07		78	59	49	59	108	0

Table 3. Shell age of male Dungeness crabs from the Southern District Dungeness pot survey, 1990–92.

Year	Dates	Location	Shell age: Number sublegals New	(%)	Old	(%)	Total	Number legal New	(%)	Old	(%)	Total	All Males New	(%)	Old	(%)	Total
1990	5/15–5/17	East of Spit	30	(64)	17	(36)	47	7	(41)	10	(59)	17	37	(58)	27	(42)	64
	6/19–6/21		52	(80)	13	(20)	65	17	(74)	6	(26)	23	69	(78)	19	(22)	88
1991	6/04–6/04	East of Spit	89	(77)	27	(23)	116	101	(92)	9	(8)	110	190	(84)	36	(16)	226
	7/09–7/11		368	(95)	20	(5)	388	262	(99)	1	(1)	263	630	(97)	21	(3)	651
	8/06–8/08		607	(97)	18	(3)	625	470	(99)	5	(1)	475	1,077	(98)	23	(2)	1,100
	9/12–9/14		596	(97)	19	(3)	615	486	(99)	6	(1)	492	1,082	(98)	25	(2)	1,107
1991	7/02–7/06	West of Spit	2	(33)	4	(67)	6	4	(80)	1	(20)	5	6	(55)	5	(45)	11
	8/14–8/16		6	(86)	1	(14)	7	7	(64)	4	(36)	11	13	(72)	5	(28)	18
1992	5/31–6/02	East of Spit	37	(13)	239	(87)	276	44	(24)	136	(76)	180	81	(18)	375	(82)	456
	6/30–7/02		153	(26)	430	(74)	583	261	(45)	317	(55)	578	414	(38)	747	(62)	1,161
	7/27–7/29		210	(34)	411	(66)	621	268	(51)	263	(49)	531	478	(41)	674	(59)	1,152
	8/11–8/13		272	(32)	577	(68)	849	328	(41)	464	(59)	792	600	(37)	1,041	(53)	1,641
	8/25–8/27		363	(43)	490	(57)	853	430	(58)	307	(42)	737	793	(50)	797	(50)	1,590
	9/10–9/12		254	(41)	367	(59)	621	436	(58)	313	(42)	749	690	(50)	680	(50)	1,370
	10/07–10/09		171	(49)	178	(51)	349	375	(73)	141	(27)	516	546	(63)	319	(37)	865
	7/05–7/07	West of Spit	3	(43)	4	(57)	7	5	(36)	9	(64)	14	8	(38)	13	(62)	21
	8/05–8/07		33	(67)	16	(33)	49	40	(68)	19	(32)	59	73	(68)	35	(32)	108

Table 4. Male Dungeness crab size data, Southern District Dungeness pot surveys, 1990–92.

Year	Date	Location	Average width (mm)	Range
1990	5/15–5/17	East of Spit	155	101 – 190
	6/19–6/21		154	102 – 189
1991	6/04–6/06	East of Spit	164	135 – 187
	7/09–7/11		163	114 – 182
	8/06–8/08		164	129 – 185
	9/12–9/14		164	127 – 189
	7/02–7/06	West of Spit	164	158 – 174
	8/14–8/16		172	158 – 197
1992	5/31–6/02	East of Spit	163	136 – 190
	6/30–7/02		165	137 – 191
	7/27–7/29		165	139 – 194
	8/11–8/13		165	142 – 196
	8/25–8/27		164	126 – 194
	9/10–9/12		166	139 – 193
	10/7–10/9		167	139 – 192
	7/05–7/07	West of Spit	171	156 – 202
	8/05–8/07		167	145 – 204

Table 5. Female Dungeness crab catch, Southern District Dungeness pot surveys, 1990–92.

Year	Dates	Location	Total females	Egg development (No.) w/eggs	Egg development (No.) w/o eggs[1]	Avg. size (mm)	Size range	Soft–shells (no.)	Shellage (no.) new	Shellage (no.) old
1990	5/15–5/17	East of Spit	53	3	50	149	113–165	6	45	8
	6/19–6/21		54	0	54	153	106–171	8	44	10
1991	6/04–6/06	East of Spit	6	0	6	152	120–163	0	4	2
	7/09–7/11		21	2	19	149	119–165	0	16	5
	8/06–8/08		85	0	85	150	116–173	0	66	19
	9/12–9/14		30	0	30	149	128–170	0	23	7
	7/02–7/06	West of Spit	9	0	9	155	135–163	0	3	6
	8/14–8/16		9	0	9	155	148–175	0	9	0
1992	5/31–6/02	East of Spit	27	2	25	143	126–164	0	14	13
	6/30–7/02		76	0	76	145	126–164	0	32	44
	7/27–7/29		65	0	65	144	115–172	0	32	33
	8/11–8/13		47	0	47	148	126–170	0	19	28
	8/25–8/27		47	0	47	145	126–167	0	16	31
	9/10–9/12		47	0	47	143	129–171	0	30	17
	10/7–10/9		19	0	19	147	126–169	2	10	9
	7/05–7/07	West of Spit	30	0	30	154	139–168	1	20	10
	8/05–8/07		59	0	59	156	141–167	0	50	9

1 Barren adults not distinguished from juveniles.

Table 6. Tanner and king crab bycatch from the Southern District Dungeness crab pot survey, 1990–1992.

Year	Dates	Location	Tanner crabs		King crabs	
			males	females	males	females
1990	5/15–5/17	East of Spit	1	0	0	0
	6/19–6/21		0	1	0	0
1991	6/04–6/06	East of Spit	101	14	2	2
	7/09–7/11		8	0	0	0
	8/06–8/08		13	0	0	0
	9/12–9/14		2	0	0	0
1991	7/02–7/06	West of Spit	76	31	0	0
	8/14–8/16		33	29	0	0
1992	5/31–6/02	East of Spit	21	0	0	0
	6/30–7/02		0	0	0	0
	7/27–7/29		0	0	0	0
	8/11–8/13		0	0	0	0
	8/25–8/27		0	0	0	0
	9/10–9/12		0	0	0	0
	10/7–10/9		0	0	0	0
	7/05–7/07	West of Spit	35	4	0	0
	8/05–8/07		40	4	0	0

Table 7. Average catch per pot of male Dungeness crab in pots with and without escape rings, 1992 Southern District Dungeness crab pot survey.

Size (5 mm groups)	Rings Closed	Rings open
Sublegals		
≤139	<0.1	<0.1
140 – 144	0.1	<0.1
145 – 149	0.4	0.1
150 – 154	1.1	0.2
155 – 159	2.5	1.2
160 – 164	3.3	2.8
Total Sublegals	7.5	4.2
Legals		
165 – 169	2.6	2.4
170 – 174	1.6	1.5
175 – 179	0.8	0.8
180 – 184	0.3	0.4
≥185	0.1	0.1
Total Legals	5.3	5.1

Table 8. Summary of Dungeness crab catch (number), Southern District crab trawl survey, 1989–92.

Date	Stations	Total Dungeness catch	Males	Average width (mm)	Range	Females	Average width (mm)	Range
Oct., 1989	11	934	304	118	28 – 216	630	124	24 – 170
July, 1990	19	977	317	134	91 – 181	660	129	102 – 171
July, 1991	20	710	234	155	111 – 183	476	134	106 – 173
July, 1992	18	687	211	157	128 – 193	476	143	116 – 174

Table 9. Dungeness crab catch by year, Cook Inlet Management Area, 1961 – 1992.

Year	Southern district catch (lbs.)	Other districts catch (lbs.)	Total catch (lbs.)	No. of Vessels	No. of Landings
1961	193,683	0	193,683	12	189
1962	530,770	0	530,770	15	269
1963	1,665,599	11,605	1,677,204	50	1,360
1964	417,005	6,036	423,041	22	341
1965	74,211	0	74,211	14	105
1966	12,523	117,037	129,560	5	28
1967	7,168	0	7,168	2	13
1968	484,452	3,407	487,859	7	224
1969	49,894	0	49,894	9	41
1970	209,819	0	209,819	10	50
1971	97,161	0	97,161	22	136
1972	38,930	0	38,930	24	206
1973	308,777	1,271	310,048	54	625
1974	718,729	2,514	721,243	38	619
1975	361,893	922	362,815	34	402
1976	118,903	395	119,298	19	123
1977	74,195	510	74,705	18	94
1978	1,212,571	3,208	1,215,779	49	668
1979	2,130,963	0	2,130,963	72	1,485
1980	1,875,281	0	1,875,281	54	1,183
1981	1,850,977	0	1,850,977	88	2,047
1982	818,380	505	818,885	108	2,310
1983	746,585	834	747,419	71	1,194
1984	799,638	570	800,208	102	1,687
1985	1,389,891	12,511	1,402,402	106	1,768
1986	550,968	12,894	563,862	83	1,069
1987	761,423	21,753	783,176	100	1,377
1988	677,334	41,941	719,275	84	1,305
1989	170,266	7,798	178,064	43	455
1990	28,938	564	29,502	23	112
1991	Season closed	0	0	0	0
1992	Season closed		Confidential [1]		

Note: Average catch 1978–1990 = 1.01 million pounds per year.

[1] Three or less participants.

Table 10. Average weights of commercial Dungeness landings, Southern District, 1975 – 84.

Year	June	July	West of Spit August	West of Spit Sept.	Oct.	Weighted Average
1975			2.91	2.73		2.85
1976						3.05
1977						2.78
1978			2.29	2.20	2.20	2.23
1979		2.53	2.54	2.61	2.52	2.55
1980						
1981	2.54	2.56				
1982			2.22			2.22
1983			2.29	2.65		2.41
1984			1.97			
			East of Spit			
1978				2.08	2.01	2.04
1979				2.00	2.25	2.12
1980						
1981		1.99	1.95	2.02		1.99
1982		1.67	2.02			1.94
1983	2.06	2.15	2.15	1.97	1.80	2.05
1984	1.94	2.00	2.09	1.96	2.00	1.99

Table 11. Incidence of soft shelled Dungeness crab, Southern District crab trawl survey, 1989–92.

Date	Total males	No. soft	(%)	Legal males	No. soft	(%)	Sublegal males	No. soft	(%)	Females	No. soft	(%)
Oct., 1989	304	33	(11)	23	1	(4)	281	32	(11)	630	48	(8)
July, 1990	317	37	(12)	6	0		311	37	(12)	660	72	(11)
July 1991	234	47	(20)	46	11	(24)	188	36	(19)	473	0	
July 1992	211	51	(24)	66	27	(41)	145	24	(17)	476	1	

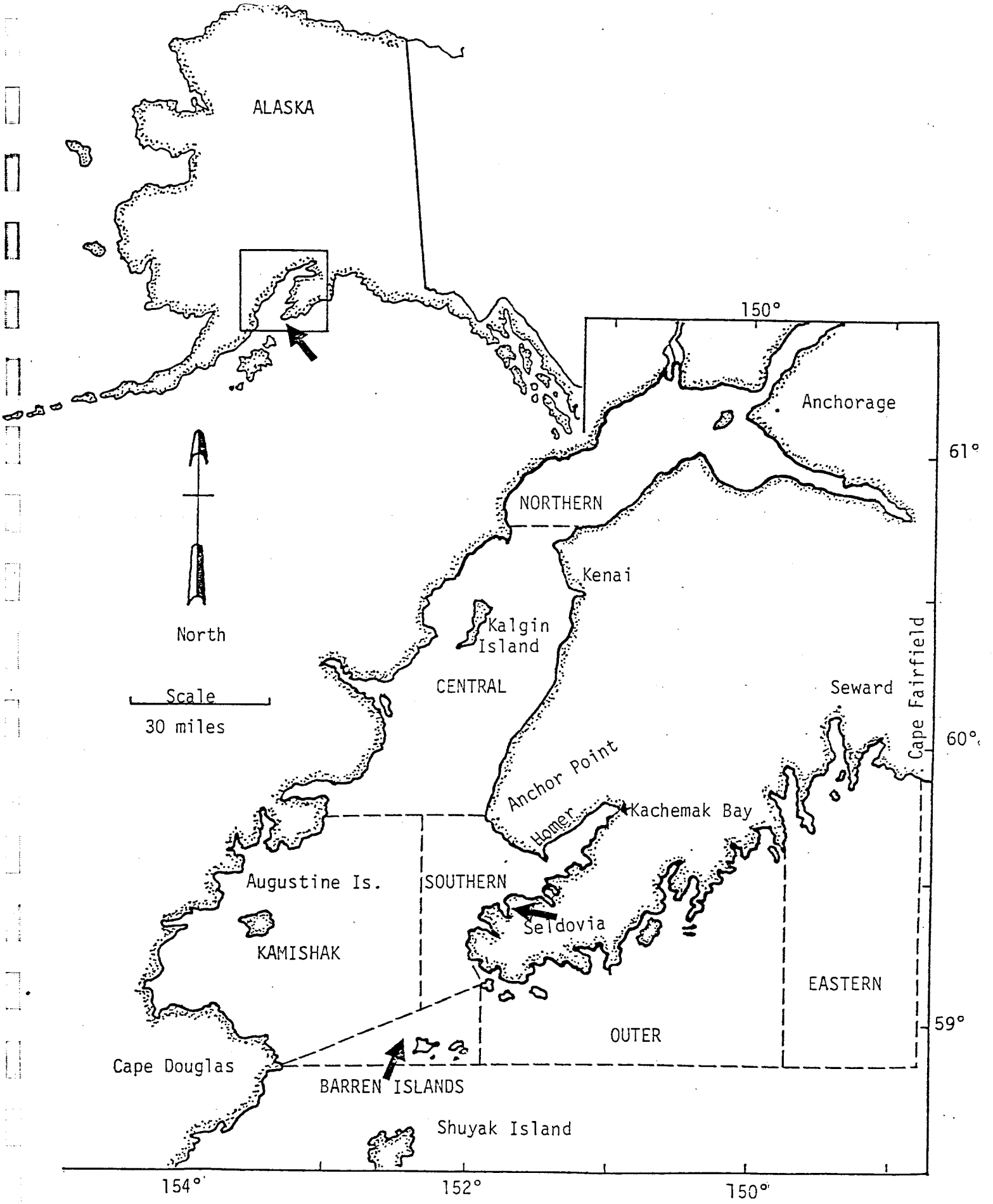

Figure 1 . Cook Inlet area district location chart.

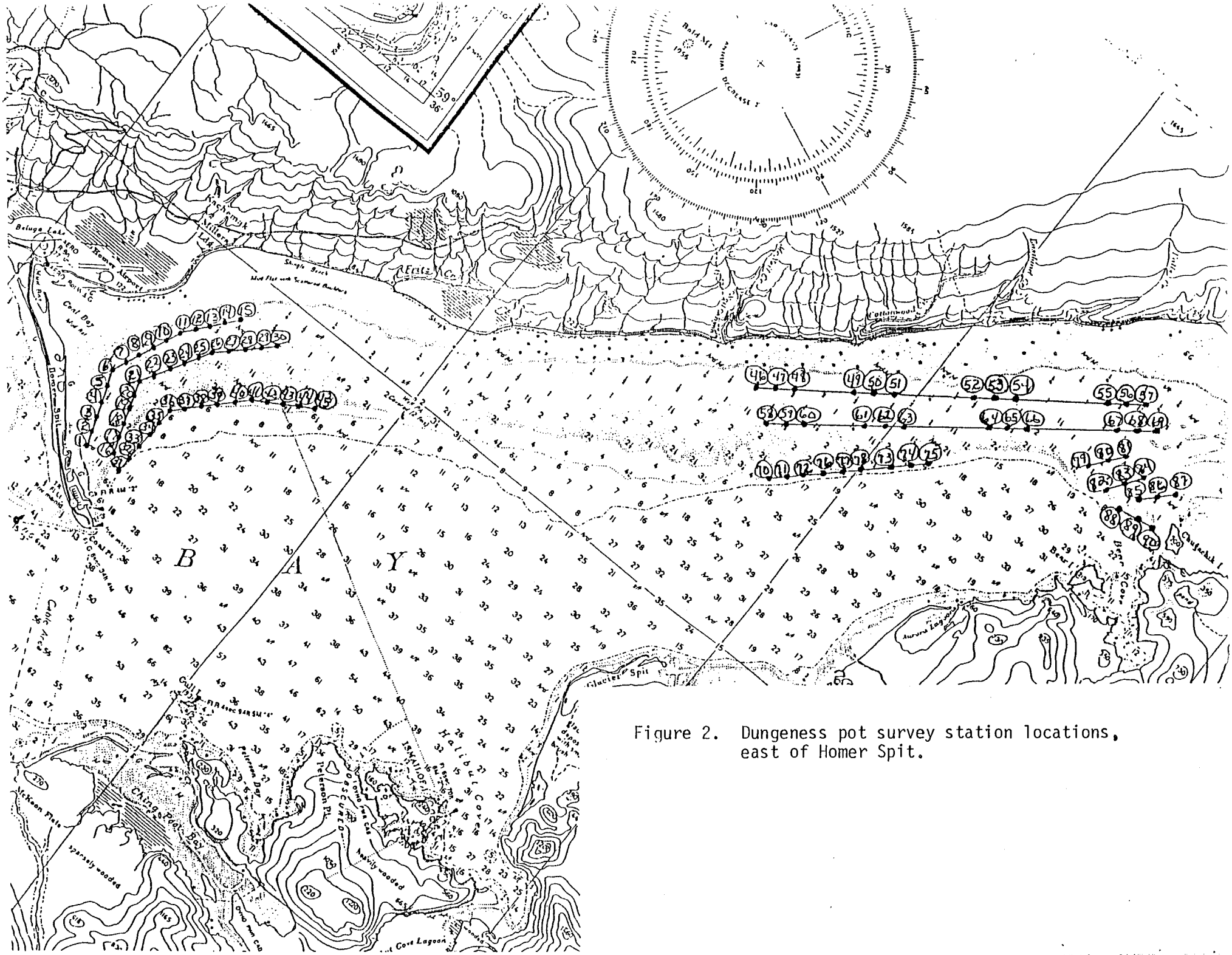

Figure 2. Dungeness pot survey station locations, east of Homer Spit.

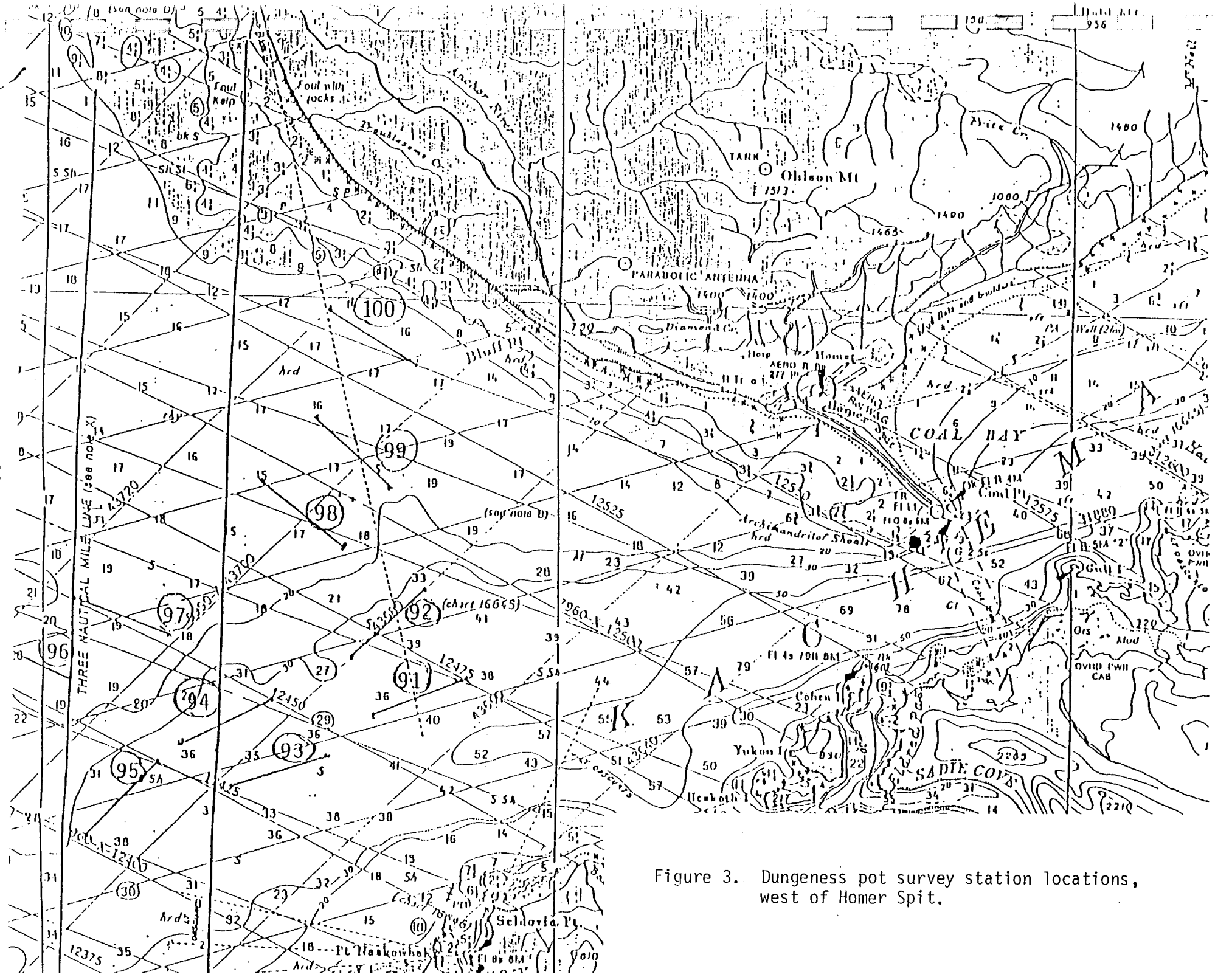

Figure 3. Dungeness pot survey station locations, west of Homer Spit.

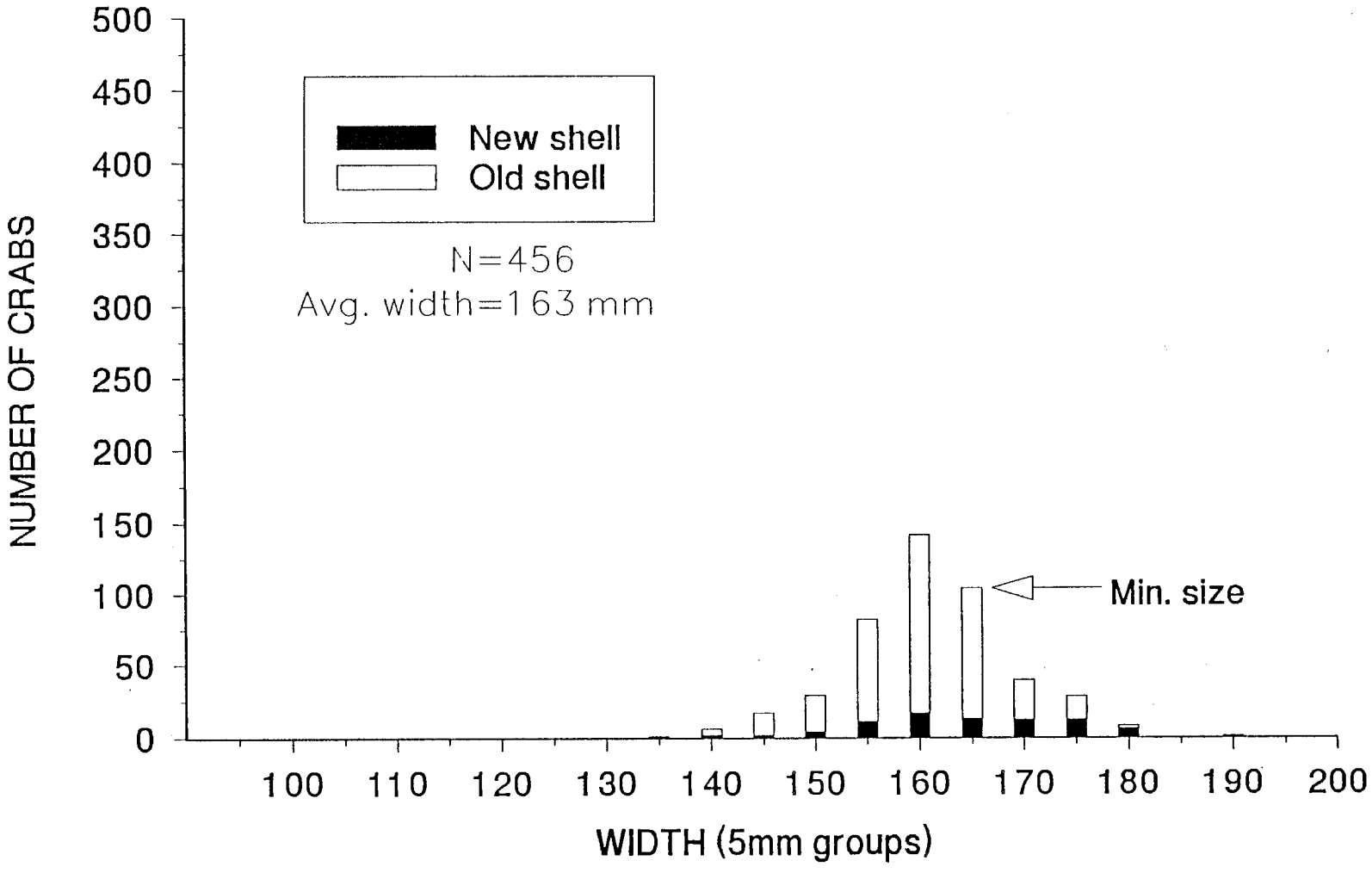

Figure 4. Male Dungeness catch, May 31 - June 2, 1992, Southern Distr. pot survey.

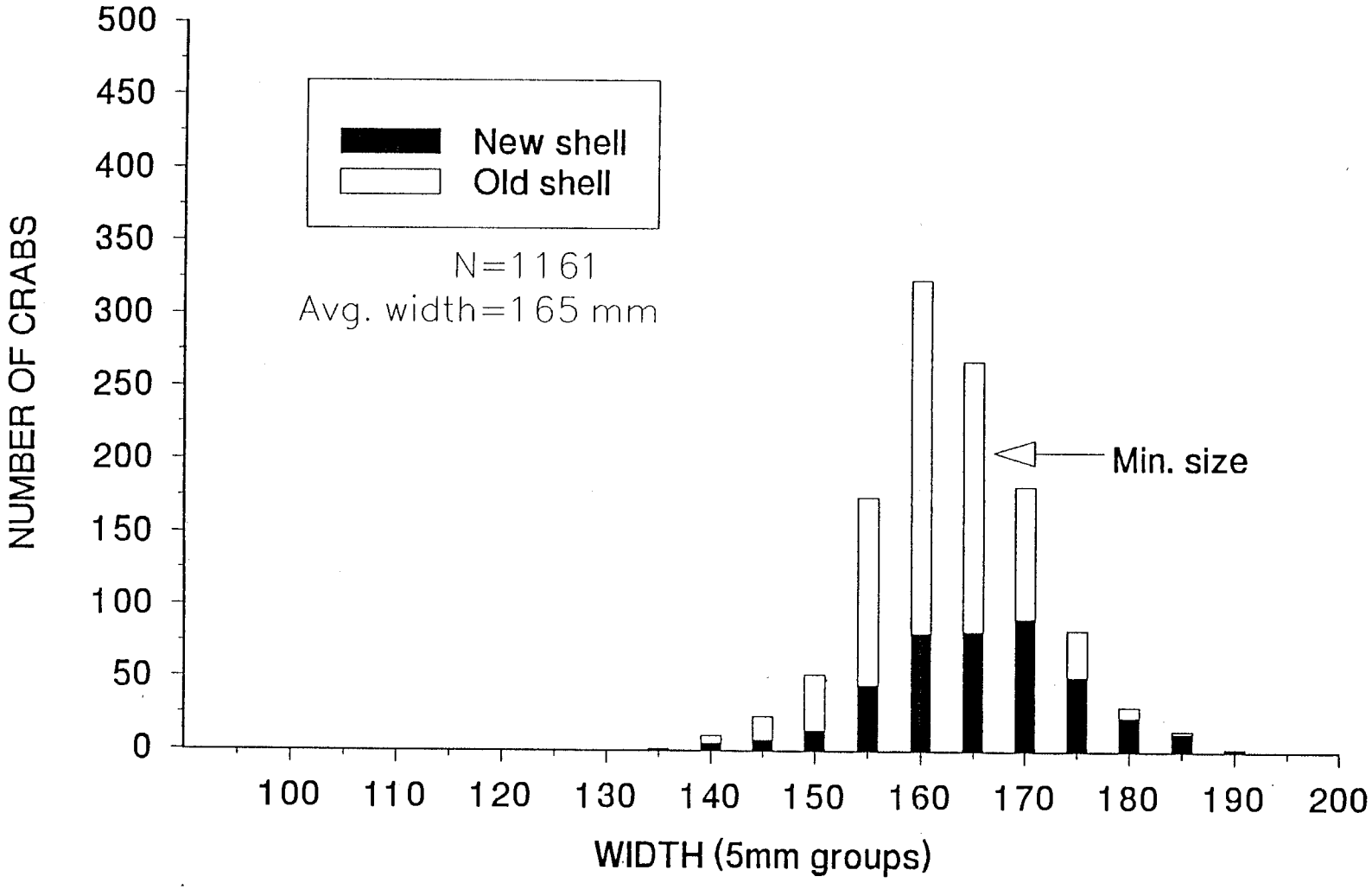

Figure 5. Male Dungeness catch, June 30 - July 2, 1992, Southern Distr. pot survey.

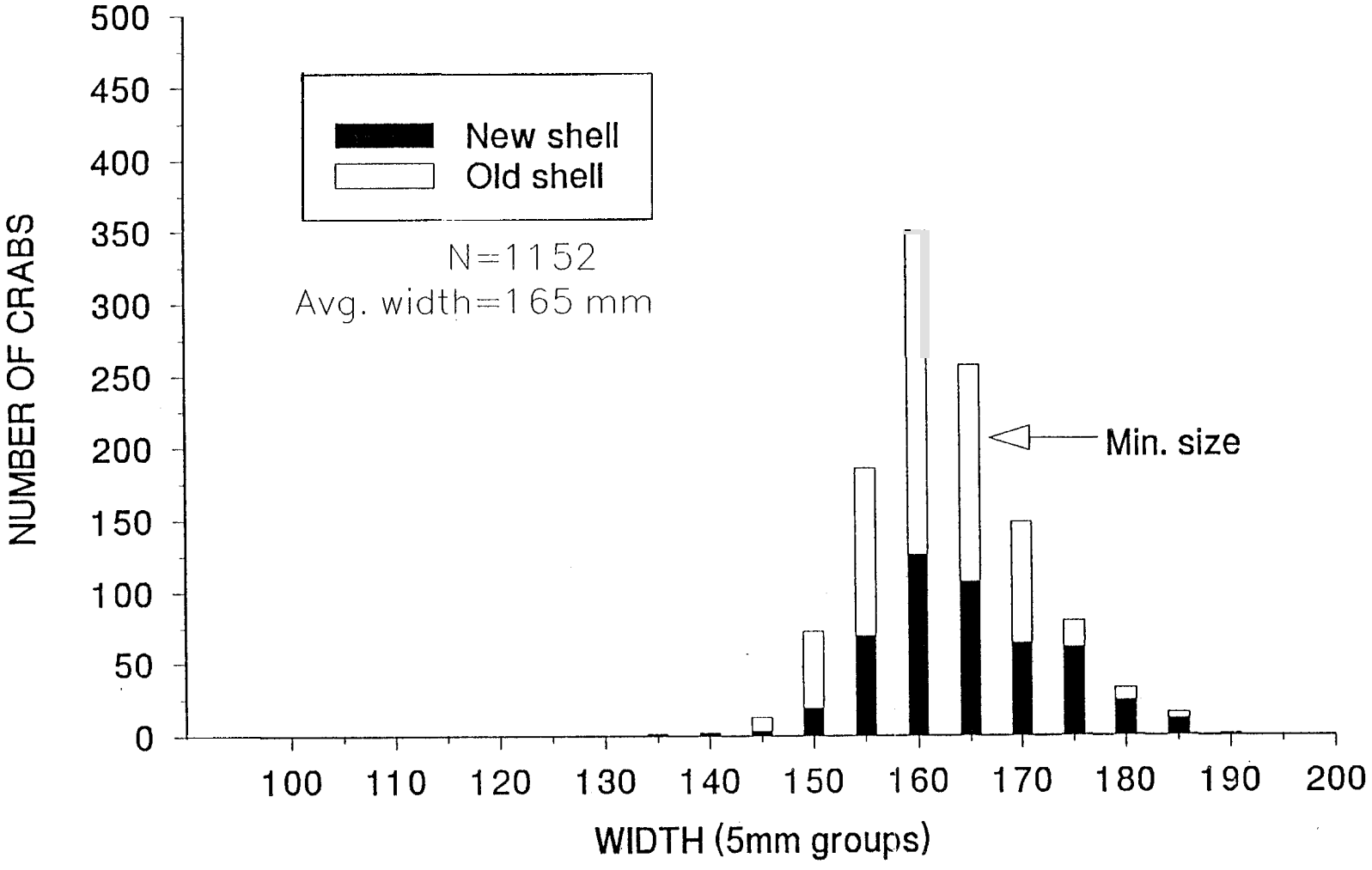

Figure 6. Male Dungeness catch, July 27 - 29, 1992, Southern Distr. pot survey.

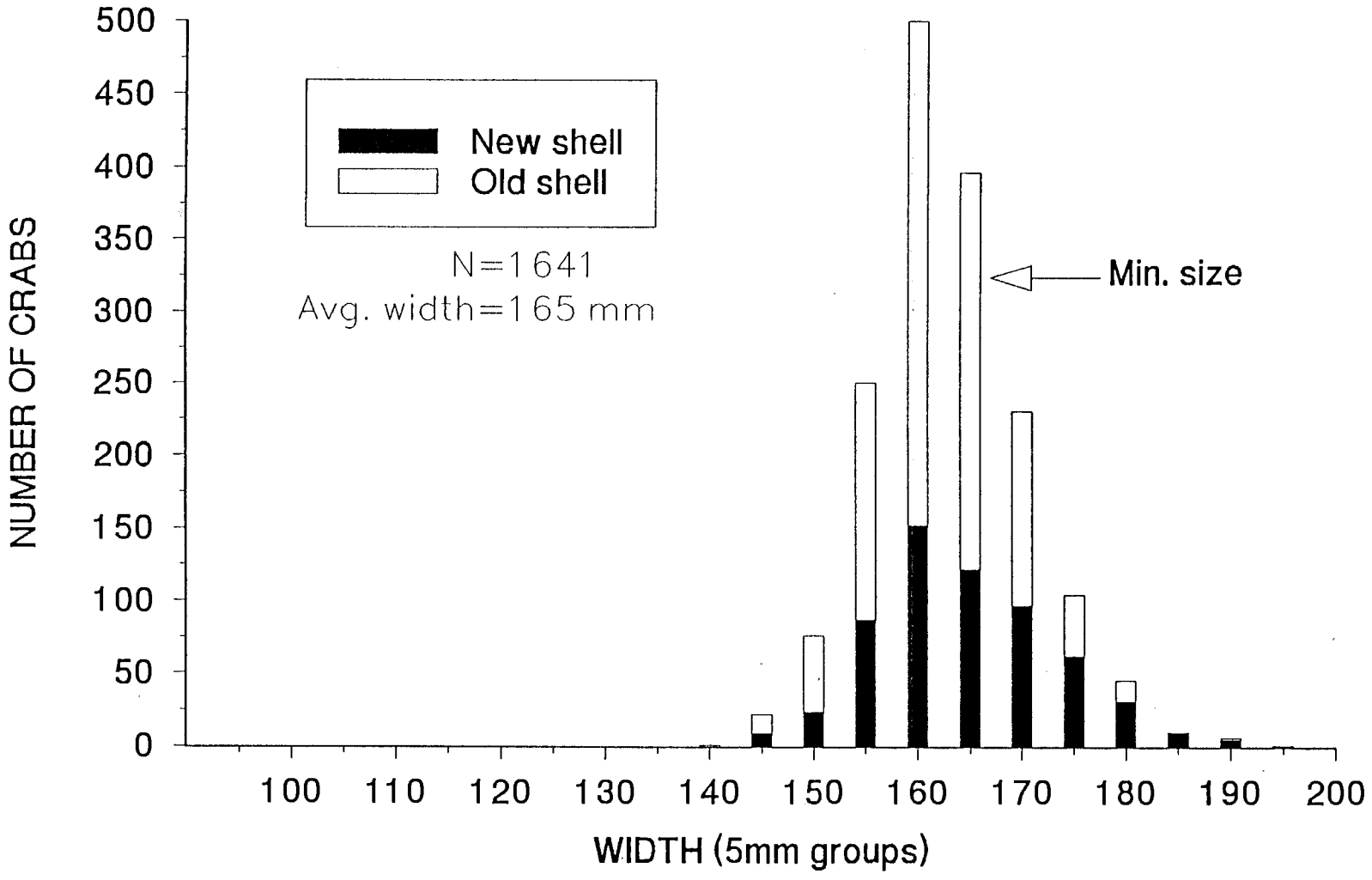

Figure 7. Male Dungeness catch, Aug. 11 - 13, 1992, Southern Distr. pot survey.

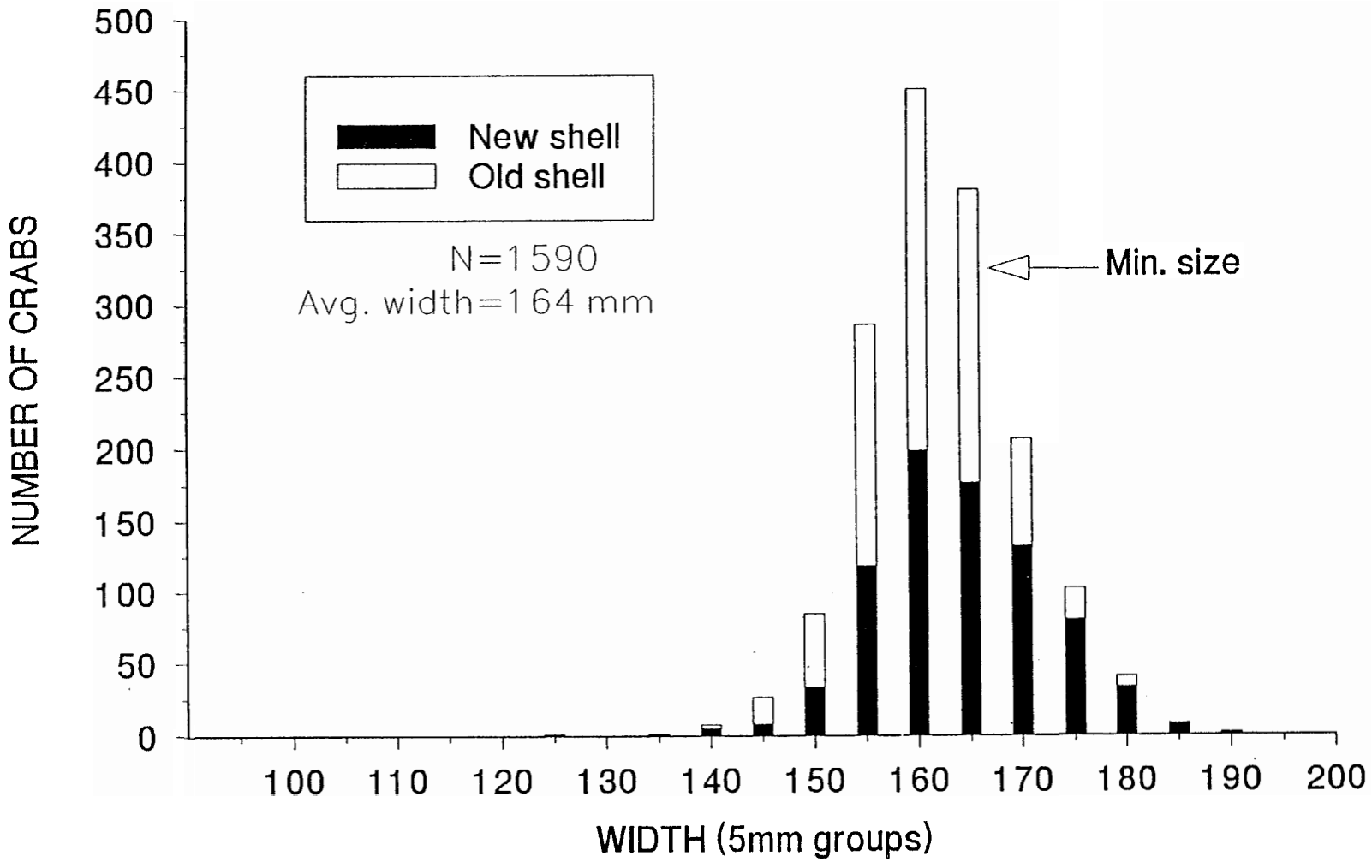

Figure 8. Male Dungeness catch, Aug. 25 - 27, 1992, Southern Distr. pot survey.

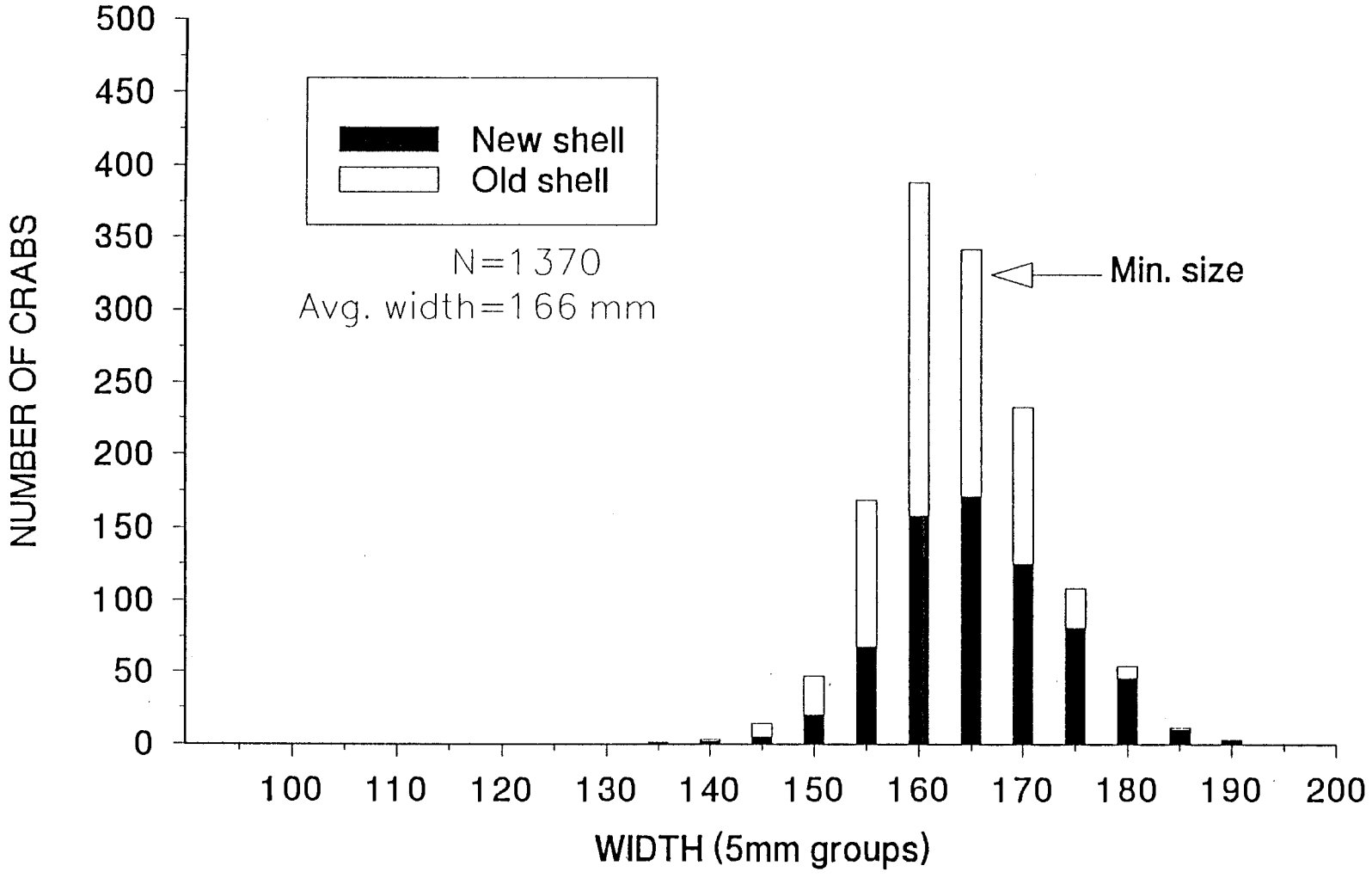

Figure 9. Male Dungeness catch, Sept 10 - 12, 1992, Southern Distr. pot survey.

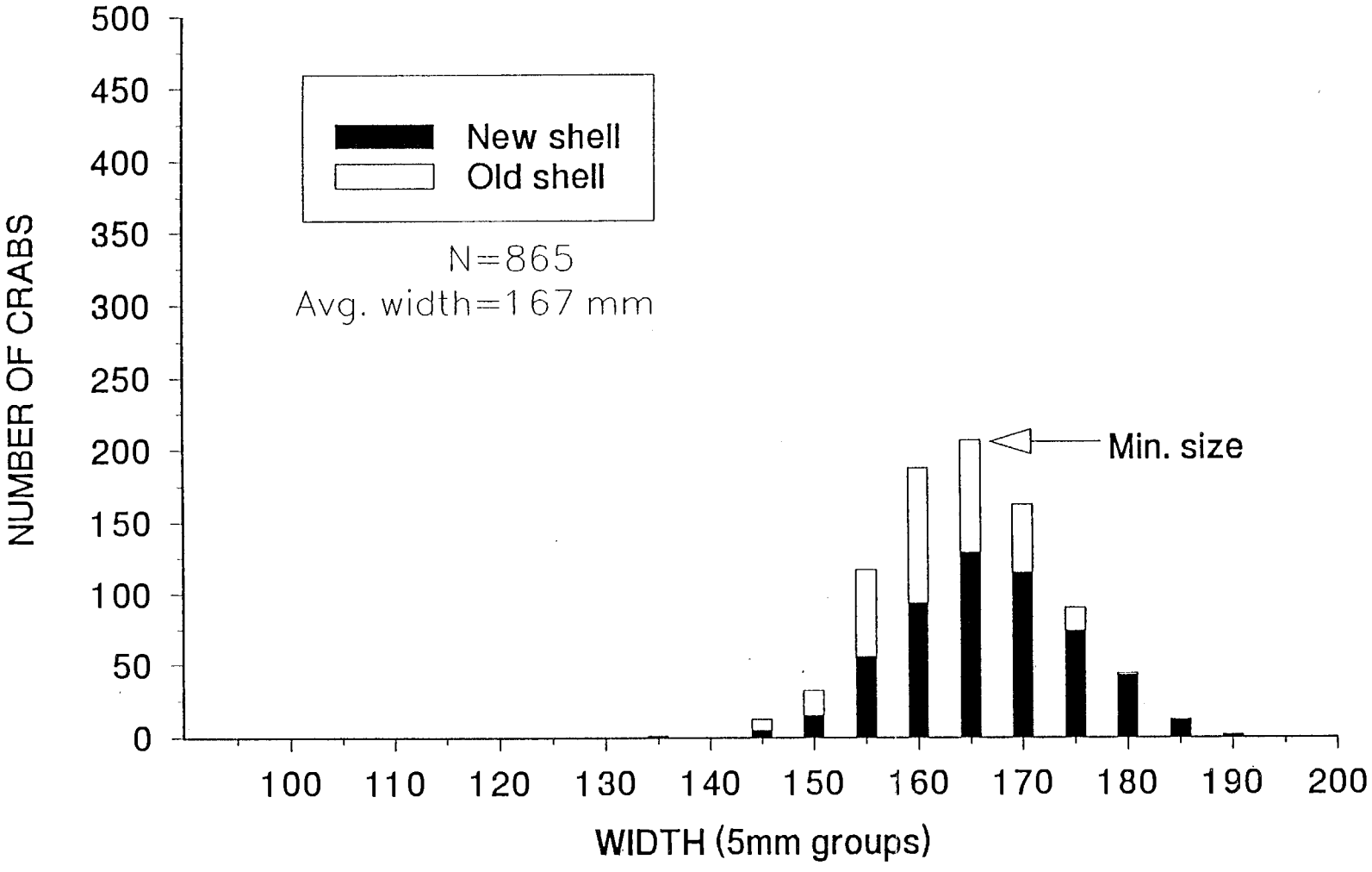

Figure 10. Male Dungeness catch, Oct. 7 - 9, 1992, Southern Distr. pot survey.

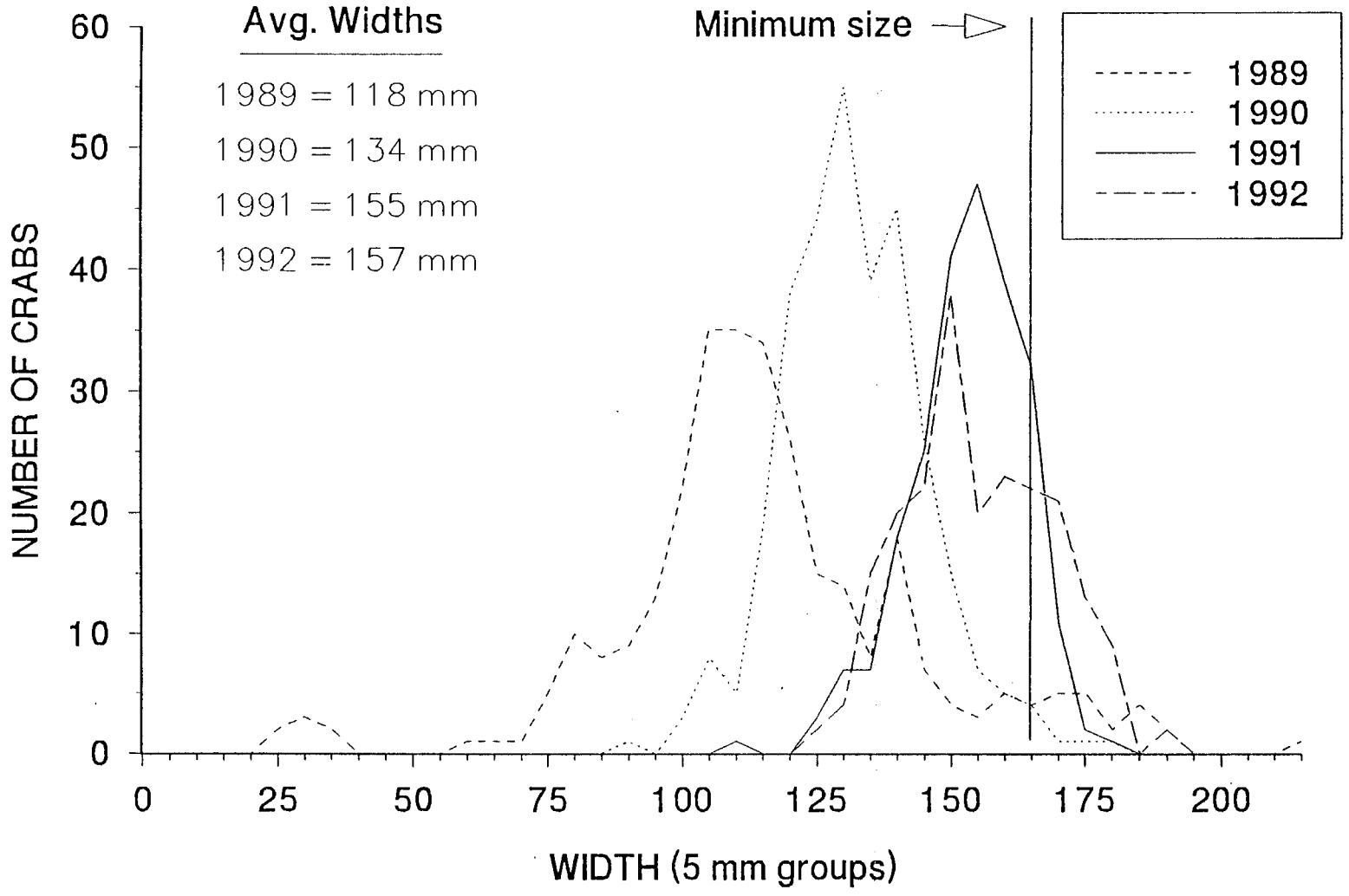

Figure 11. Male Dungeness catch, 1989 - 92, Southern Distr. trawl survey.

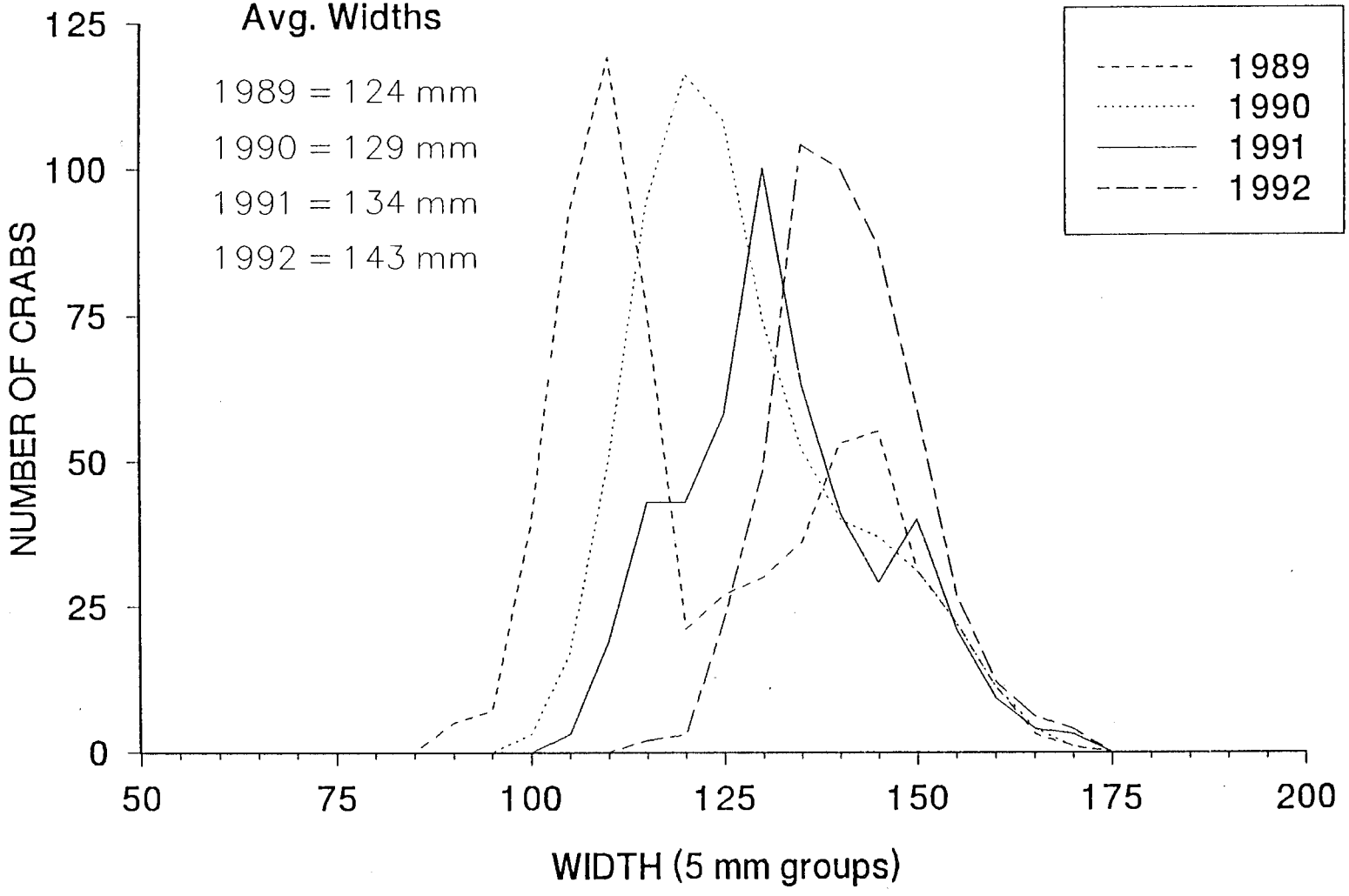

Figure 12. Female Dungeness catch, 1989 - 92, Southern Distr. trawl survey.

Appendix A. Survey station locations, east of Homer Spit, Southern District Dungeness pot survey, 1990-91.

Station No.	Latitude	Longitude
1.	59° 36'.90	151° 25'.90
2.	59° 37'.15	151° 26'.10
3.	59° 37'.35	151° 26'.30
4.	59° 37'.60	151° 26'.50
5.	59° 37'.82	151° 26'.65
6.	59° 38'.06	151° 26'.50
7.	59° 38'.30	151° 26'.30
8.	59° 38'.52	151° 26'.10
9.	59° 38'.80	151° 25'.90
10.	59° 38'.92	151° 25'.52
11.	59° 39'.10	151° 25'.15
12.	59° 39'.28	151° 24'.75
13.	59° 39'.45	151° 24'.40
14.	59° 39'.60	151° 24'.00
15.	59° 39'.72	151° 23'.55
16.	59° 37'.03	151° 25'.39
17.	59° 37'.30	151° 25'.50
18.	59° 37'.52	151° 25'.62
19.	59° 37'.75	151° 25'.76
20.	59° 38'.03	151° 25'.95
21.	59° 38'.25	151° 25'.63
22.	59° 38'.43	151° 25'.39
23.	59° 38'.67	151° 25'.12
24.	59° 38'.89	151° 24'.78
25.	59° 39'.03	151° 24'.40
26.	59° 39'.18	151° 23'.98
27.	59° 39'.30	151° 23'.51
28.	59° 39'.45	151° 23'.11
29.	59° 39'.60	151° 22'.70
30.	59° 39'.73	151° 22'.26
31.	59° 36'.84	151° 25'.05
32.	59° 37'.07	151° 25'.00
33.	59° 37'.31	151° 24'.91
34.	59° 37'.57	151° 24'.82
35.	59° 37'.85	151° 24'.72
36.	59° 38'.10	151° 24'.35
37.	59° 38'.28	151° 23'.95
38.	59° 38'.47	151° 23'.57
39.	59° 38'.64	151° 23'.20
40.	59° 38'.80	151° 22'.70
41.	59° 38'.92	151° 22'.30
42.	59° 39'.08	151° 21'.80
43.	59° 39'.20	151° 21'.40
44.	59° 39'.32	151° 20'.96
45.	59° 39'.46	151° 20'.50

Appendix A. Continued.

Station No.	Latitude	Longitude
46.	59° 42'.78	151° 13'.35
47.	59° 42'.95	151° 12'.90
48.	59° 43'.11	151° 12'.45
49.	59° 43'.70	151° 10'.97
50.	59° 43'.87	151° 10'.51
51.	59° 44'.05	151° 10'.10
52.	59° 44'.58	151° 08'.70
53.	59° 44'.75	151° 08'.21
54.	59° 44'.92	151° 07'.80
55.	59° 45'.50	151° 06'.30
56.	59° 45'.67	151° 05'.89
57.	59° 45'.83	151° 05'.40
58.	59° 42'.55	151° 12'.55
59.	59° 42'.71	151° 12'.11
60.	59° 42'.88	151° 11'.70
61.	59° 43'.45	151° 10'.30
62.	59° 43'.62	151° 09'.86
63.	59° 43'.08	151° 09'.40
64.	59° 44'.38	151° 08'.00
65.	59° 44'.55	151° 07'.53
66.	59° 44'.72	151° 07'.10
67.	59° 45'.28	151° 05'.65
68.	59° 45'.45	151° 05'.23
69.	59° 45'.65	151° 04'.80
70.	59° 42'.01	151° 11'.55
71.	59° 42'.23	151° 11'.18
72.	59° 42'.45	151° 10'.88
73.	59° 43'.05	151° 09'.50
74.	59° 42'.25	151° 09'.10
75.	59° 43'.48	151° 08'.70
76.	59° 42'.53	151° 10'.78
77.	59° 42'.72	151° 10'.43
78.	59° 42'.92	151° 10'.04
79.	59° 44'.80	151° 05'.67
80.	59° 45'.02	151° 05'.20
81.	59° 45'.24	151° 04'.75

Appendix A. Continued.

Station No.	Latitude	Longitude
82.	59° 44'.62	151° 05'.10
83.	59° 44'.90	151° 04'.65
84.	59° 45'.13	151° 04'.25
85.	59° 44'.75	151° 04'.30
86.	59° 45'.00	151° 03'.90
87.	59° 45'.23	151° 03'.40
88.	59° 44'.62	151° 04'.60
89.	59° 44'.67	151° 04'.01
90.	59° 44'.72	151° 03'.78

Appendix B. Survey station locations, west of Homer Spit, Southern District Dungeness pot surveys, 1991.

Station No.[1]	Begin (lat., long.)	End (lat., long.)
91	59°32.55 151°43.50	59°31.90 151°47.10
92	59°34.40 151°45.15	59°33.00 151°48.00
93	59°31.00 151°48.80	59°30.40 151°52.70
94	59°32.20 151°51.00	59°31.20 151°54.60
95	59°30.90 151°55.50	59°29.50 151°58.20
96	59°32.50 151°59.00	59°33.30 152°02.75
97	59°33.35 151°55.00	59°34.05 151°58.80
98	59°35.10 151°48.30	59°36.35 151°51.50
99	59°36.30 151°46.50	59°37.70 151°49.40
100	59°38.75 151°45.50	59°39.75 151°48.90

[1] Ten pots were set equidistant apart in each station.

Appendix C. Catch per unit of effort (cpue) of male Dungeness crabs from the Southern District Dungeness crab pot survey, 1990–92.

Year	Dates	Location	Cpue					
			Sublegal males	(range)	Legal males	(range)	Total males	(range)
1990	5/15–5/17	East of Spit	0.5	(0–5)	0.2	(0–2)	0.7	(0–5)
	6/19–6/21		0.7	(0–5)	0.3	(0–3)	1.0	(0–7)
1991	6/04–6/06	East of Spit	1.3	(0–11)	1.2	(0–13)	2.5	(0–19)
	7/09–7/11		4.3	(0–31)	2.9	(0–14)	7.2	(0–35)
	8/06–8/08		6.9	(0–23)	5.3	(0–18)	12.2	(0–38)
	9/12–9/14		6.8	(0–31)	5.5	(0–20)	12.3	(0–46)
1991	7/02–7/06	West of Spit	0.1	(0–3)	0.1	(0–4)	0.1	(0–6)
	8/14–8/16		0.1	(0–2)	0.1	(0–3)	0.2	(0–5)
1992	5/31–6/02	East of Spit	3.1	(0–16)	2.0	(0–12)	5.1	(0–22)
	6/30–7/02		6.6	(0–30)	6.5	(0–27)	13.0	(0–47)
	7/27–7/29		7.0	(0–27)	5.9	(0–18)	12.9	(0–35)
	8/11–8/13		9.4	(0–29)	8.8	(0–29)	18.2	(0–58)
	8/25–8/27		9.7	(0–27)	8.4	(0–33)	18.1	(0–49)
	9/10–9/12		7.0	(0–20)	8.4	(0–34)	15.4	(0–50)
	10/7–10/9		5.7	(0–16)	3.9	(0–34)	9.6	(0–42)
	7/05–7/07	West of Spit	0.1	(0–3)	0.1	(0–3)	0.2	(0–6)
	8/05–8/07		0.6	(0–8)	0.8	(0–11)	1.4	(0–12)

CPUE – average number of crabs caught per pot.